

Notice of Allowability

Application No.

09/830,447

Examiner

Sharad Rampuria

Applicant(s)

DUFFETT-SMITH ET AL.

Art Unit

2617

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/03/2007.
2. ☒ The allowed claim(s) is/are 1-15.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application |
| 2. <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 7. <input type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |

DETAILED ACTION

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Ms. Stacey Longanecker (Reg. No. 33,952) and inventor Mr. DUFFETT-SMITH, PETER on 10/30/07.

2. The application has been amended as follows:

1. (Amended) A method of generating in a virtual location measurement unit a list of offsets relative to a common reference, said list of offsets being in time, phase, frequency, or derivatives thereof, or their equivalents expressed as offsets in distance or derivatives thereof, of a plurality of transmission source signals, which would be received at a given location, [relative to a common reference,] the method comprising;

(a) acquiring, in the virtual location measurement unit, data from plural receivers, [the position of which may be known or determined,] the plural receivers not necessarily fixed or at known positions, the data from [a] each of the plural receivers comprising offsets in time, phase, frequency, or derivatives thereof, respectively of signals received from the transmission sources relative to a reference source in each receiver or to each other; and

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(b) combining the acquired data and calculating the list of offsets relative to the common reference in the virtual location measurement unit.

2. (Amended) A method of generating in a virtual location measurement unit a list of offsets relative to a common reference, said list of offsets being in time, phase, frequency, or derivatives thereof, or their equivalents expressed as offsets in distance or derivatives thereof, of a plurality of transmission source signals, which would be received at a given location, [relative to a common reference], the method comprising;

(a) acquiring, in the virtual location measurement unit, data from plural receivers, [the position of which may be known or determined,] the plural receivers not necessarily fixed or at known positions, the data from [a] each of the plural receivers being representative of the received signals;

(b) determining from the acquired data, in the virtual location measurement unit, the offsets in time, phase, frequency, or derivatives thereof, respectively of signals received from the transmission sources relative to a reference source in each receiver or to each other; and

(c) combining the determined offsets [so determined] and calculating the list of offsets relative to the common reference in the virtual location measurement unit.

3. (Amended) A radio positioning method for determining [the] a position of one receiver or positions of more receivers [the positions of], which the position of one receiver or the positions of more receivers are unknown, which method comprises generating the list of offsets according to [includes the method of] claim 1 or claim 2.

8. (Amended) Apparatus for generating, in a virtual location measurement unit, a list of offsets relative to a common reference, said list of offsets being in time, phase, frequency, or derivatives thereof, or their equivalents expressed as offsets in distance or derivatives thereof, of a plurality of transmission source signals, which would be received at a given location, [relative to a common reference,] the method comprising;

(a) means for acquiring, in the virtual location measurement unit, data from plural receivers, [the position of which may be known or determined,] the plural receivers not necessarily fixed or at known positions, the data from [a] each of the plural receivers comprising offsets in time, phase, frequency, or derivatives thereof, respectively of signals received from the transmission sources relative to a reference source in each receiver or to each other; and

(b) means for combining the acquired data and calculating the list of offsets relative to the common reference in the virtual location measurement unit.

9. (Amended) Apparatus for generating, in a virtual location measurement unit, a list of offsets relative to a common reference, said list of offsets being in time, phase, frequency, or derivatives thereof, or their equivalents expressed as offsets in distance or derivatives thereof, of a plurality of transmission source signals, which would be received at a given location, [relative to a common reference]; the method comprising;

(a) means for acquiring, in the virtual location measurement unit, data from plural receivers, [the position of which may be known or determined,] the plural receivers not

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necessarily fixed or at known positions, the data from [a] each of the plural receiver being representative of the received signals;

(b) means for determining from the acquired data, in the virtual location measurement unit, the offsets in time, phase, frequency, or derivatives thereof, respectively of signals received from the transmission sources relative to a reference source in each receiver or to each other; and

(c) means for combining the determined offsets [so determined] and calculating the list of offsets relative to the common reference in the virtual location measurement unit.

Allowable Subject Matter

3. Claims 1-15 are allowed.

4. The following is an examiner's statement of reasons for allowance:

The claimed invention is directed to a virtual location measurement unit to calculate and maintain a **list** of offsets in time, phrase, frequency, or derivatives thereof, of a plurality of transmission source signals, i.e., signals from base stations, corresponding to a given location relative to a common reference, i.e., an imaginary universal absolute clock, such that the combined **list** of timings generated is equivalent to that which would be observed had there been a real location measurement unit at a virtual location measurement unit's location making timing measurement of every base stations in a network, wherein **the virtual location measurement unit may not necessary be physically existed at the virtual location measurement unit's location for making timing measurement**. The advantages of the present invention are (1) the ability to avoid the need to fix multiple receivers in known positions; (2) the

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fact that different mobile receivers get significantly different signals such that the data relating to which is therefore more useful of the overall system; and (3) the fact that, since no mobile receiver can receive signals from all transmitters in the system, the use of a generated list which can be used across the system as a whole avoids the need for additional redundancy. The latter point is critical to an effective real system.

Applicant's independent claims 1, 2, 8 and 9 each recited an apparatus or method of generating a list of offsets relative to a common reference in a virtual location measurement unit, said list of offsets being in time, phase, frequency, or derivatives thereof, or their equivalents expressed as offsets in distance or derivatives thereof, of a plurality of transmission source signals which would be received at a given location with a specific structure as defined in the specification (pages 11-13) including the functions or steps of (a) acquiring, in the virtual location measurement unit, data from plural receivers, the plural receivers not necessarily fixed or at known positions, the data from each of the plural receivers comprising offsets in time, phase, frequency, or derivatives thereof, respectively of signals received from the transmission sources relative to a reference source in each receiver or to each other; and (b) combining the acquired data and calculating the list of offsets relative to the common reference in the virtual location measurement unit, which are taught nor suggested by the prior art.

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The closest prior art, *Duffett-Smith et al (WO 9711384 A1)* discloses a system and method whereby a fixed base station and a mobile receiver receive signals from two or more

transmitters (e.g., BTSs), and information about the received signals is passed from the fixed station and the mobile receiver to a position determining processor for comparison purposes to determine the location of the mobile receiver. *Duffett-Smith et al* does not describe a system or method that produces a list as recited in the independent claims 1, 2, 8 and 9; rather, *Duffett-Smith et al* arguably creates plural lists of received signal offsets. In other words, each receiver creates a list of offsets of the signals received from the specific transmitters (e.g., BTSs) from which it was able to decode the transmitted signals. Since each receiver is at a different location, each of the receivers' lists contains offset values in respect of the signals from different sets of the transmitters. None of the receivers can receive signals from all of the transmitters due to their different locations. Thus, *Duffett-Smith et al* merely teaches generating a set of individual lists or received signal time offsets at different receivers. The claimed invention, by contrast, calculates a list of time offsets from plural receivers relative to a common reference (e.g., as stated above, a real, hypothetical or virtual receiver at a chosen or given location). In other words, the recited list of time offsets provides location information as if the entire network had been observed by one receiver. In addition, the offset referred to in *Duffett-Smith et al* is the offset of a known point in the signals received at the fixed base station and roving receiver (e.g., handset) and not transmission time offsets as recited in item (a) in claim 1 and similar recitation in claims 2, 8 and 9 (e.g., offsets of signals from plural transmission sources (e.g., BTSs) at each of plural receivers. (FIG. 4; Pg.11; 10-31).

Moreover, the prior art, **Dunn (US 5600706 A)** teaches in the second method of synchronization, after the range transceiver receives timing correction information via the time adjust message 63, rather than physically altering transmissions, the range transceiver 30 would

encode the timing correction factor for transmission over the forward link sync channel. This timing correction factor conveys the error between the range transceiver 30 transmission time and the master reference time. The correction factor would be encoded within the sync channel message capsule padding bits as illustrated in FIG. 9. Upon receiving the timing correction factor, a location equipped mobile unit 32 would correct for the timing error before processing the time of arrival (or time difference of arrival) information to calculate a position estimate. The mobile unit 32 would not necessarily be required to readjust its own clock time, but instead correct the arrival times by the appropriate offsets, before calculating position. (FIG. 9; Col.13; 8-24).

Furthermore, the prior art, **Sood (US 5293645 A)** teaches in FIG. 4 illustrates a block diagram of a base station for use in the network according to the present invention. Each base station includes a station synchronization unit 200, a transmitter 201, a receiver 202, and a network interface 203. The station synchronization unit 200 receives the master timing reference across line 204 and generates a base station timing reference signal across line 205 which is adjusted based upon network parameters, such as known or measured propagation times for the master timing reference signal to the base station, to be synchronized with other base station timing reference signals. The base station timing reference signal is transmitted at pre-established intervals by the transmitter 201. The master timing reference 204 may be supplied directly to the station synchronization unit 200, as heuristically shown in FIG. 4, or may be supplied through the network interface 203, depending on the implementation of a particular network. (Fig.4; Col.5; 6-23).

In addition, the prior art, **Gilhousen (US 5859612 A)** teaches in steps 305, 310, 315 and 320, first, second, third and fourth different CDMA signals (each of which has a separate preassigned Walsh code) are respectively transmitted from the first, second and third slave antennas and the master antenna at the base station. The first, second, third and fourth signals are transmitted on a common CDMA traffic channel. In the event that the first, second and third signals are transmitted from slave antennas positioned in different sectors, the first, second and third signals will also have different pn code phases corresponding to the sectors from which such signals were transmitted. In steps 325, 330, 335 and 340, the four signals transmitted in steps 305, 310, 315 and 320 are respectively received by the mobile station. The mobile station has means for simultaneously demodulating multiple signals having different Walsh codes and different pn code phases, and for determining a clock synchronization setting (or a relative reception time) associated with each such signal. In step 345, by comparing the differences between the clock synchronization settings associated with the signals transmitted from the master antenna and the slave antennas, the mobile station is able to calculate arrival time differences corresponding to the relative times when the signals transmitted in steps 305, 310, 315 and 320 were received by the mobile station. Finally, in step 350, the arrival time differences for the signals transmitted in steps 305, 310, 315 and 320 are used to calculate at least two hyperbolic lines of position. The system then identifies one or more intersections between these hyperbolic lines of position. If the system finds more than one such intersection, the exact position of the mobile station may be resolved by using a sector antenna at the base station to select the intersection that represents the true position of the mobile station in the cellular system. (Fig.3; Col.9; 29-62).

Additionally, the prior art, **Lidquist (US 6166691)** teaches a reference terminal used in positioning/locating of mobile terminals in a radiocommunication system is described. The reference terminal includes a time-of-arrival (TOA) receiver which is used to provide information associated with the location of mobile terminals. The TOA receiver also performs the function of calibrating the time delays within the reference terminal by measuring time delays associated with each time-sensitive component. For example, when the reference terminal transmits an uplink signal burst, e.g., reporting TOA information associated with a particular mobile terminal, a portion of this signal energy can be captured and propagated through antenna cables within the reference terminal. The TOA receiver can be used to determine time delays associated with the returned signal energy through various paths, which delays can be used to calibrate the positioning information generated by the reference terminal. (Abstract).

Additionally, the prior art, **Ludden (US 6347228)** teaches a Apparatus for determining the location of a subscriber unit (1) in a mobile telecommunications network, and particularly in a GSM cellular network, includes the provision of several receiver stations (4, 5, 6) positioned at separate known locations within each cell. Each of the receiver stations (4, 5, 6), which are synchronised by means of an on-board GPS receiver (10), measures the time of arrival of a message transmitted from the subscriber unit (1). The time of arrival measurements recorded by each receiver station (4, 5, 6) are then transmitted to a base transceiver station (2) for computation of the subscriber unit's location relative to the receiver stations. The apparatus can provide a reasonably accurate means for location with a low susceptibility to interference. (Abstract).

Additionally, the prior art, **Parl et al. (US 5883598)** teaches a position location system includes multiple base stations spaced over a region. A portable unit within the region transmits a locating signal which is received by the base stations. The base stations report amplitude, phase and time data related to the locating signal to a control station. The control station includes a processor and memory that combine the data from all of the participating base stations to directly compute an optimal estimate of the location of the portable unit. The control station generates an ambiguity function based upon the probability that the portable unit is located at a particular position. By optimizing the ambiguity function, the error in the computation is minimized to produce an accurate position estimate. (Abstract).

Additionally, the prior art, **Karr et al. (US 20030146871)** teaches a location system is disclosed for commercial wireless telecommunication infrastructures. The system is an end-to-end solution having one or more location centers for outputting requested locations of commercially available handsets or mobile stations (MS) based on, e.g., CDMA, AMPS, NAMPS or TDMA communication standards, for processing both local MS location requests and more global MS location requests via, e.g., Internet communication between a distributed network of location centers. The system uses a plurality of MS locating technologies including those based on: (1) two-way TOA and TDOA; (2) pattern recognition; (3) distributed antenna provisioning; and (4) supplemental information from various types of very low cost non-infrastructure base stations for communicating via a typical commercial wireless base station infrastructure or a public telephone switching network. Accordingly, the traditional MS location difficulties, such as multipath, poor location accuracy and poor coverage are alleviated via such technologies in combination with strategies for (a) automatically adapting and calibrating system

performance according to environmental and geographical changes; (b) automatically capturing location signal data for continual enhancement of a self-maintaining historical data base retaining predictive location signal data; (c) evaluating MS locations according to both heuristics and constraints related to, e.g., terrain, MS velocity and MS path extrapolation from tracking and (d) adjusting likely MS locations adaptively and statistically so that the system becomes progressively more comprehensive and accurate. Further, the system can be modularly configured for use in location signaling environments ranging from urban, dense urban, suburban, rural, mountain to low traffic or isolated roadways. Accordingly, the system is useful for 911 emergency calls, tracking, routing, people and animal location including applications for confinement to and exclusion from certain areas. (Abstract).

However, all the above prior-art fails to anticipate or render the above limitations in combination with all the limitations as recited in independent claims 1, 2, 8 and 9 obvious over any of the prior art of record, alone or in combination.

Consequently, Claims 1-2 and 8-9 are allowed on behalf of above-discussed reasons, and also preserved via Applicants arguments and remarks filed on 08/01/2007 as well. Since rest of the claims is dependent on one of the above independent claim, therefore they are also allowable.

Conclusion

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharad Rampuria whose telephone number is (571) 272-7870. The examiner can normally be reached on M-F. (8:30-5 EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Eng can be reached on (571) 272-7495. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000 or *EBC@uspto.gov*.

/Sharad Rampuria/
Patent Examiner
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